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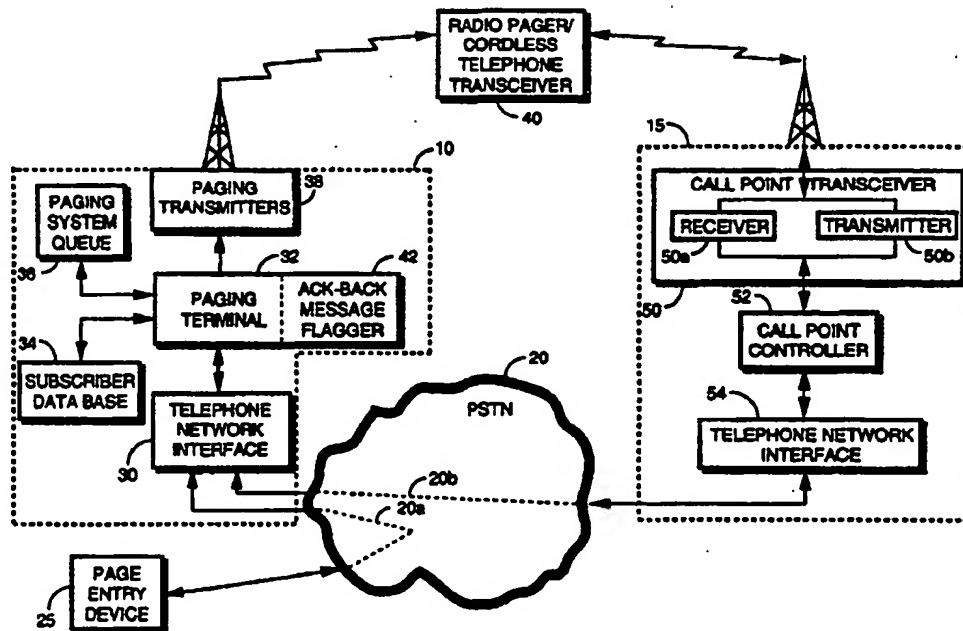


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(54) Title: PAGING SYSTEM AND METHOD WITH ACKNOWLEDGE BACK SIGNALING USING A RADIO TELEPHONE SYSTEM



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/11439

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,P	US,A, 5,175,758 [Levanto et al.] 29 December 1992, Figs. 1-4.	1-10

(57) Abstract

A combination radio paging receiver and radio telephone (40) includes a receiver (214) for receiving paging signals provided from a paging terminal (32), a decoder (216) for decoding the paging signals to recover a page, and a controller (220) for determining whether the page requests an acknowledge back signal. A radio telephone section (205) couples the controller (220) to a radio telephone system (15) to form a radio telephone link with the paging terminal (32) for communicating the acknowledge back signal to the paging terminal (32) via the radio telephone link in response to determining that the page requests the acknowledge back signal (304).

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INTERNATIONAL SEARCH REPORT

In national application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) : H04M 11/00

US CL : 379/57

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/57,58,61,63; 340/825.44; 371/5.5,32,35

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
noneElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
none**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US,A, 5,202,912 [Breedon et al.] 13 April 1993, col.8, lines 9-52; Figs.2 and 4.	1-10
Y	US, A, 4,882,579 [Siwiak] 21 November 1989, col.3, lines 11-62; col.14, lines 4-22; Figs.4 and 6.	1-10
Y,P	US, A, 5,168,502 [Millet] 01 December 1992, col.1, line 43 to col.2, line 4; Figs.2 and 4.	2,9-10
A	US,A, 5,153,902 [Buhl et al.] 06 October 1992, Figs. 1-4.	1-10
A	US,A, 5,153,903 [Eastmond et al.] 06 October 1992, Figs.1-7B.	1-10

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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**PAGING SYSTEM AND METHOD WITH ACKNOWLEDGE BACK
SIGNALING USING A RADIO TELEPHONE SYSTEM**

Field of the Invention

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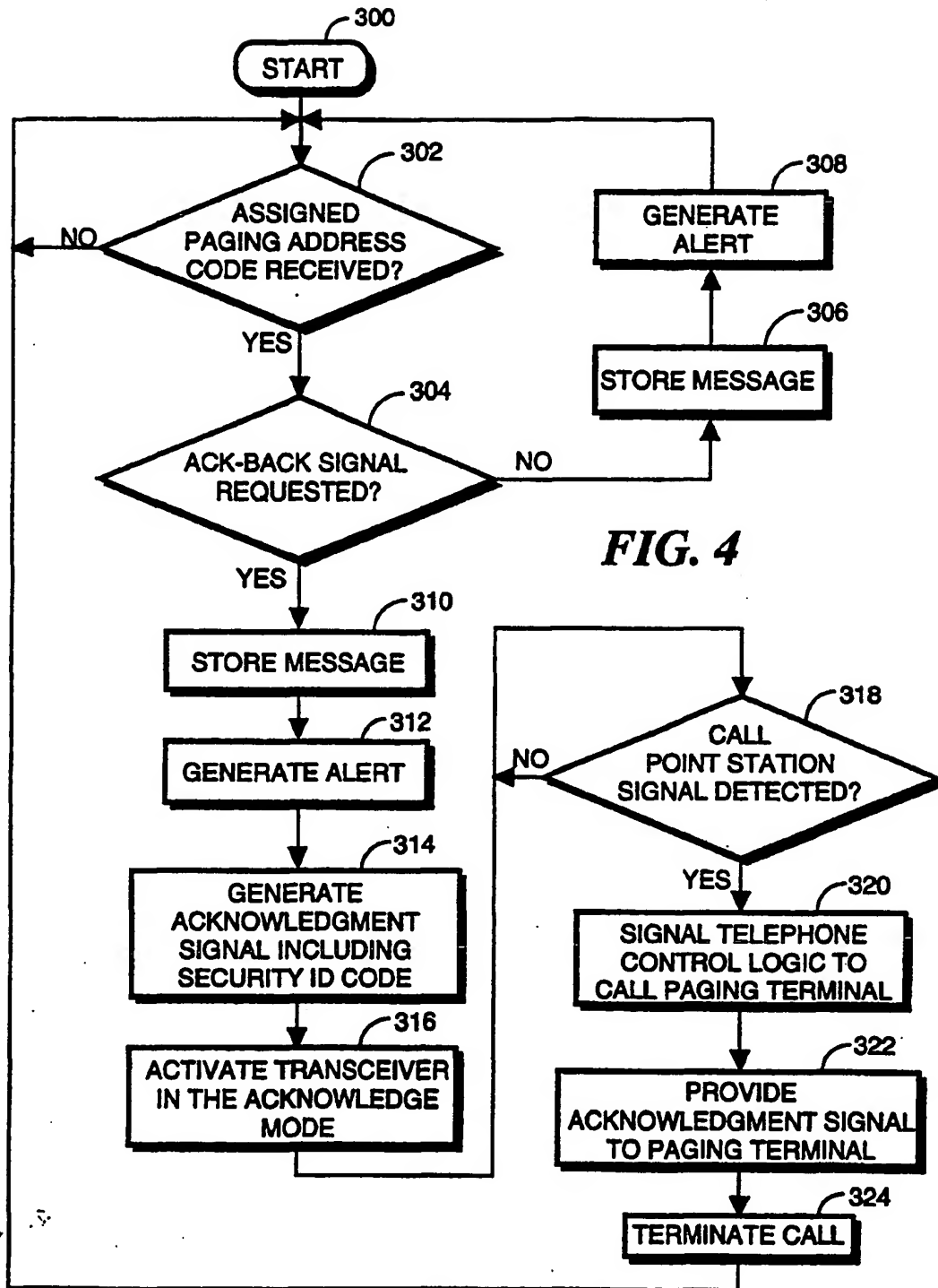
This invention relates in general to a combination paging system and radio telephone system, and in particular to a method and apparatus for paging with acknowledge back signaling utilizing a radio telephone
10 system.

Background of the Invention

Selective call signaling systems (e.g., paging
15 systems) provide one-way radio frequency (RF) communication of selective call messages, called pages, from a message originator to a paging receiver. The message originator contacts the paging system via the public switched telephone network system or other input
20 interface means and provides the message information to a paging terminal. The message information is encoded into a conventional signaling protocol, modulated onto a carrier signal, and transmitted as an RF signal to the paging receiver. The paging receiver receives the signal,
25 demodulates and decodes the signal to recover the message, and presents the message to the system subscriber who is the user of the receiver.

Since selective call signaling is a one-way communication system, the message originator is typically
30 unaware of whether the subscriber receives a message. Acknowledge back (ack-back) signaling has been developed to inform the system of the reception of a message by a receiver. Yet, to avoid interference between the paging signals and the ack-back signals either a communications
35 path or system air time must be reserved for the ack-back signals. Air time is a precious commodity in selective call signaling systems, particularly a wide area paging

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system with numerous subscribers. A selective call system service provider wishes to provide service for a large number of subscribers in order to obtain high revenue. Therefore it is desirable that air time not be reserved
5 for ack-back signals.

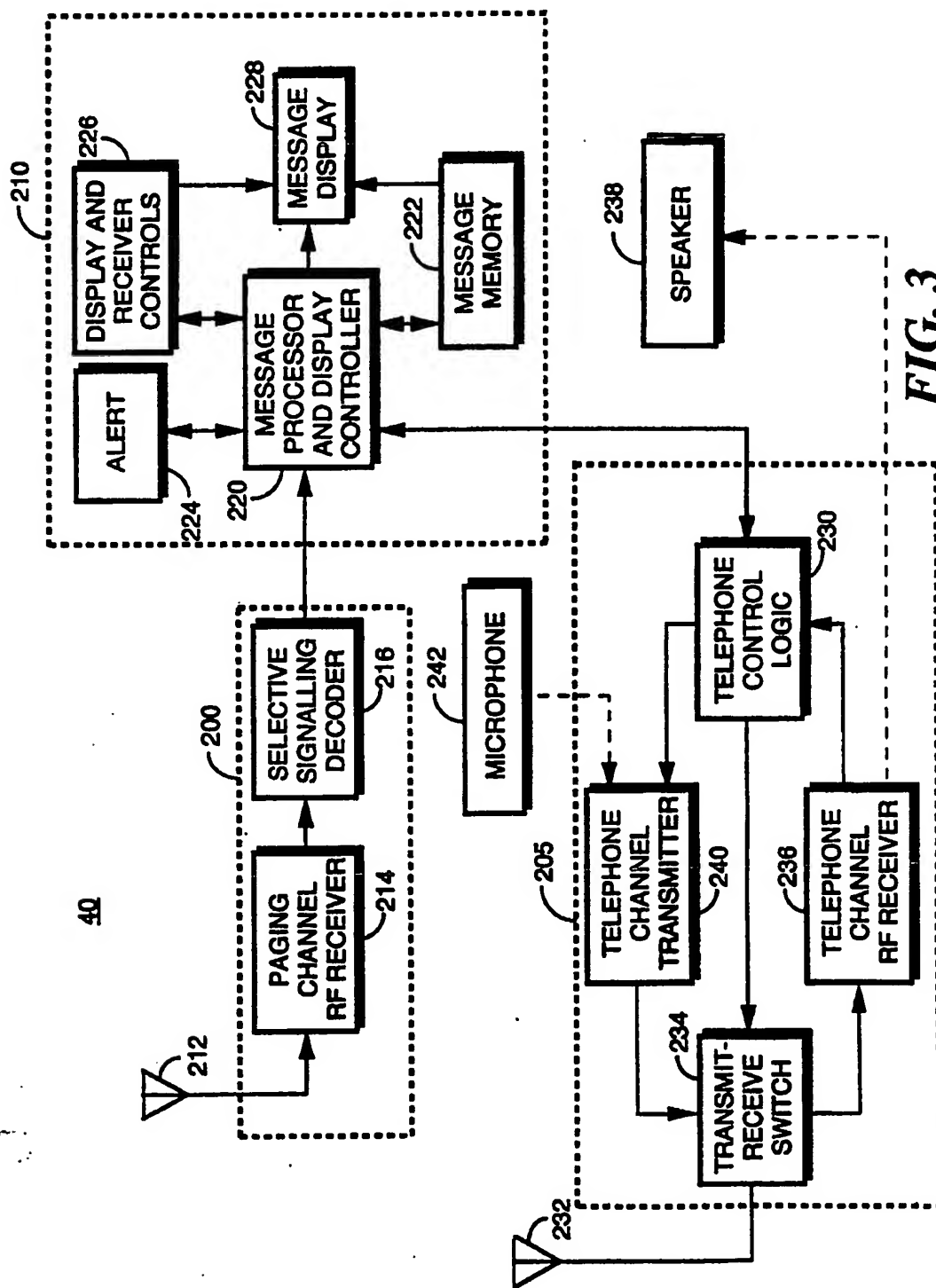
Since selective call signaling systems are one-way signaling systems, an ack-back communications path would involve costly investment by the service provider to construct a communications path devoted to ack-back
10 signaling. Additionally, ack-back signals are infrequent and typically require little air time. Therefore, a devoted communications path would be inefficient and could not provide the service provider a sufficient monetary return for the added feature of ack-back.

15 Thus, what is needed is an ack-back signaling system which does not take air time from the selective call signaling system, while not requiring a devoted communications path.

20 Summary of the Invention

In carrying out the invention in one form, there is provided a selective call receiver comprising a radio frequency (RF) receiver for receiving paging signals
25 transmitted from a paging terminal, a decoder coupled to the RF receiving means for decoding the paging signals to recover a page, a flagged page identifier for determining whether the page is a flagged page requesting an acknowledge back, and a controller for coupling to the
30 paging terminal via a radio telephone system and for transmitting an acknowledge back signal thereby in response to the flagged page identifier determining that the page is a flagged page.

35 In another form there is provided a method for transmitting messages in a paging system to a combination radio telephone and radio pager. The method comprises the steps of receiving message information from a message



originator, determining whether the message originator wishes an acknowledge back signal in response to reception of the message information by the radio pager, flagging the message information as a flagged message requesting an
5 acknowledge back signal upon reception if the message originator wishes an acknowledge back signal, and transmitting the flagged message to the combination radio telephone and radio pager. The method further comprises the steps of coupling to the combination radio telephone
10 and radio pager via a radio telephone system, receiving the requested acknowledge back signal via the radio telephone system, and advising the message originator that the message was received.

15 Brief Description of the Drawing

FIG. 1 is a diagram of a combination paging system and cordless telephone system in accordance with the preferred embodiment of the present invention.

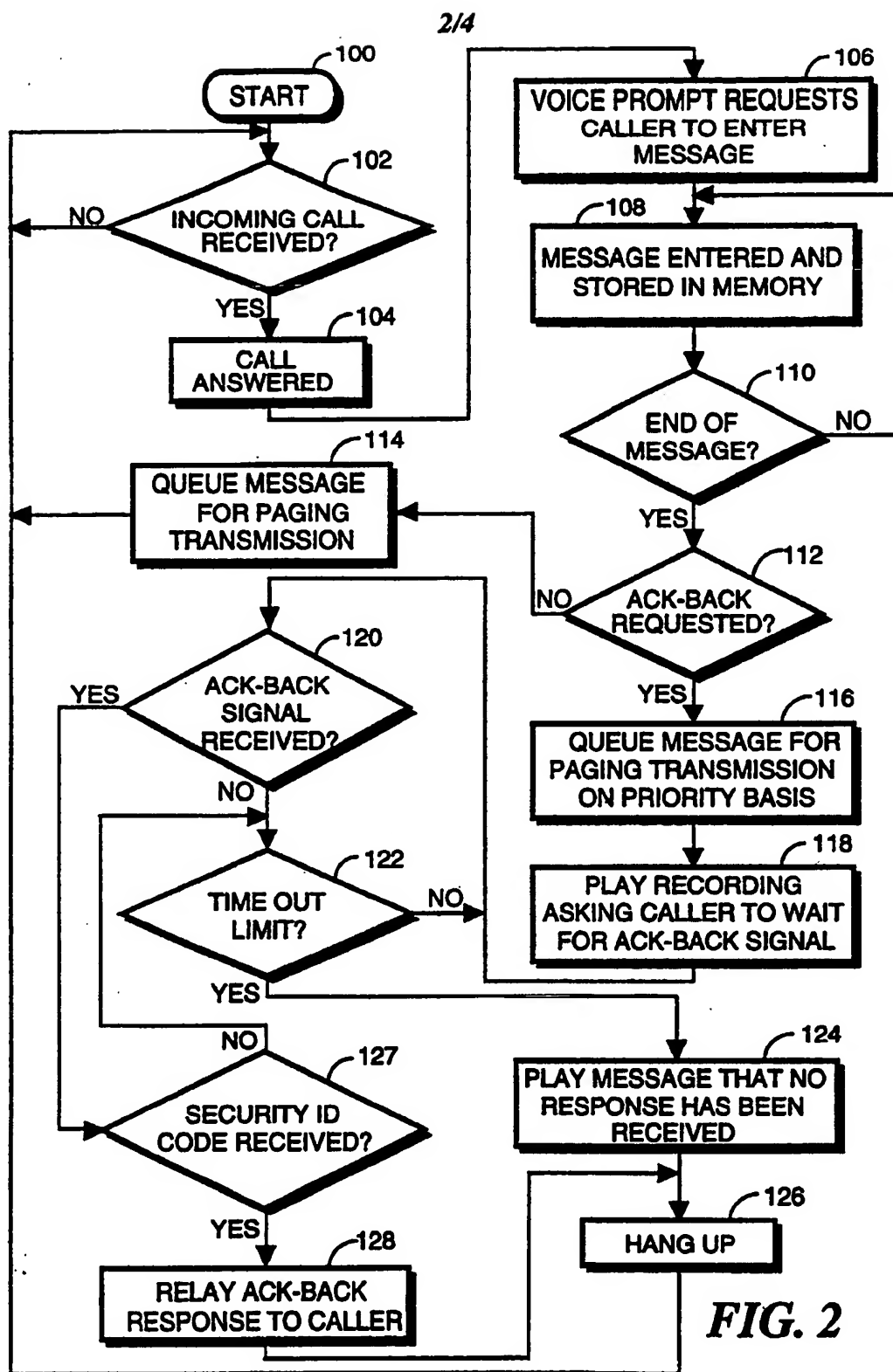
20 FIG. 2 is a flow diagram of the operation of the paging terminal in the combination paging system and cordless telephone system of FIG. 1 in accordance with the preferred embodiment of the present invention.

FIG. 3 is a block diagram of the combination radio pager and cordless telephone transceiver of FIG. 1 in
25 accordance with the preferred embodiment of the present invention.

FIG. 4 is a flow diagram of the operation of the paging message processor in the combination radio pager
30 and cordless telephone of FIG. 3 in accordance with the preferred embodiment of the present invention.

Detailed Description of the Invention

35 Referring to FIG. 1, a selective call signaling system combining a wide area paging system 10 and a radio telephone system, such as a cordless telephone system 15,



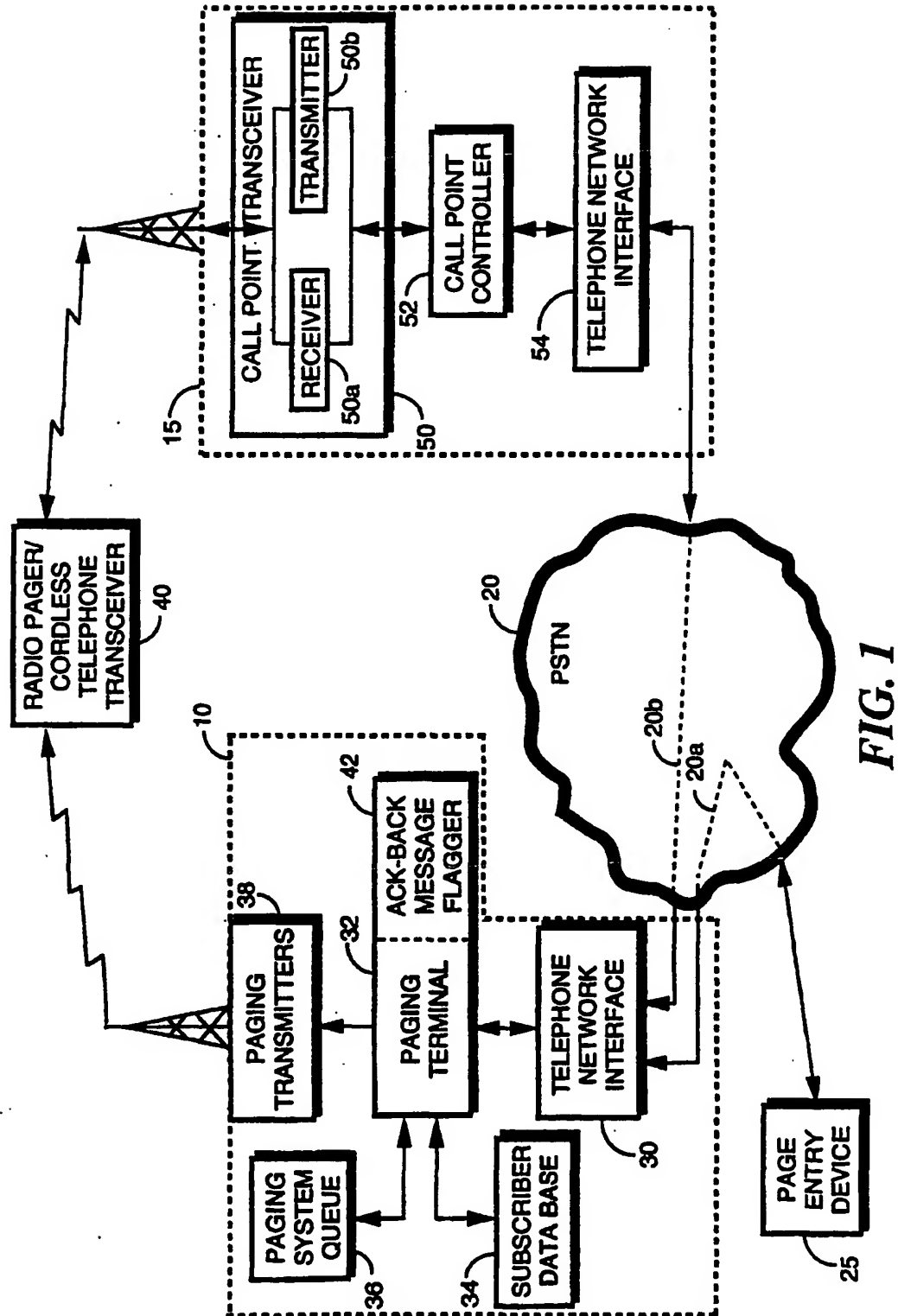
uses the public switched telephone network (PSTN) 20 for communication therebetween. The preferred embodiment of the present invention utilizes a second generation cordless telephone (CT-2) system, which is a less
5 expensive alternative to other radio telephone systems such as cellular telephone systems. A message originator utilizes a page entry device 25 to enter paging information via the PSTN 20 for encoding and transmission to a subscriber of the paging system 10.

10 Typically, the page entry device 25 is a telephone for entry of voice or numeric information. The page entry device 25 could also comprise a data processing device, such as a computer terminal, for generation of paging information comprising graphics, facsimile or alphanumeric
15 information.

The message originator initiates a message transmission sequence via the page entry device 25 by entering a voice or data message in the form of a call to the system access number of the specific paging device
20 (such as a radio pager/radio telephone 40) to be called. The message originator is coupled to a paging terminal 32 via a telephone network interface 30 of the paging system 10 and PSTN path 20a for processing by the paging terminal 32. When the incoming call is answered by the paging
25 terminal 32, a pre-recorded message is played that welcomes the message originator to the system 10, and describes how the originator can enter a paging message and request an optional acknowledgment that the message was received. The originator then responds by entering
30 the voice or data message and a special code signal to indicate that an acknowledgment of successful reception of the message is desired.

In the paging terminal 32, the message is initially entered in a buffer memory. Then, after the originator
35 has ended the message entry sequence, the paging terminal 32 accesses a subscriber data base 34 to obtain a subscriber address to associate with the paging

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information to form a page. In accordance with the present invention, if the originator has entered the special code signal indicating an acknowledgment is desired, an acknowledge-back (ack-back) message flagger 5 portion 42 of the paging terminal 32 flags the message and the terminal 32 places the flagged message into the paging system queue 36 for later transmission. The ack-back flagger 42 can, for example, flag the message by using an address that is reserved for messages with acknowledge 10 requests, or it can attach an acknowledgment request flag to a general addressing functional portion of the message.

The pages stored in the paging system queue 36 are retrieved sequentially by the paging terminal 32 and provided to the paging transmitters 38 for transmission as 15 selective call signals therefrom.

Selective call signals transmitted from the paging system 10 are received by the combination radio pager and radio telephone 40. The pager receives the selective call signals. The radio telephone, such as a CT-2 cordless 20 telephone transceiver, couples to the PSTN 20 via the radio telephone system 15 for communication therewith.

In accordance with the preferred embodiment of the present invention, the combination radio pager/cordless telephone transceiver 40 receives selective call signals 25 broadcast by the paging system 10 via the paging transmitters 38. If a flagged message is received by the combination radio pager/cordless telephone transceiver 40, a cordless telephone link is established between the combination radio pager/cordless telephone transceiver 40 30 and the cordless telephone system 15.

A call point transceiver 50, comprising a receiver portion 50a and a transmitter portion 50b, receives the acknowledgment signal from the combination radio 35 pager/cordless telephone transceiver 40 along with information identifying an access number for accessing the paging system 10 via the PSTN 20. The acknowledgment signal and the access information are provided to a call

9. The selective call receiver of Claim 7 wherein the controller comprises:

means for detecting a number of errors in the page;
and

- 5 means for coupling to the radio telephone system in response to the detection means detecting a number of errors greater than a predetermined number;
means for generating a retransmission signal; and
means for transmitting the retransmission signal via
10 the radio telephone system to the paging terminal.

10. A selective call receiver comprising:

a radio frequency (RF) receiver for receiving paging signals transmitted from a paging terminal;

- 15 a decoder coupled to the RF receiving means for decoding the paging signals to recover a page;

an error detector means for detecting a number of errors in the page; and

- a controller for coupling to the paging terminal via
20 a radio telephone system and for transmitting a retransmission signal thereby in response to the error detector detecting a number of errors greater than a predetermined number.

point controller 52 which utilizes the access information to call up the paging system 10 via a telephone network interface 54 of the cordless telephone call point station 15. Once the call is established between the call point controller 52 and the paging terminal 32 via path 20b through the PSTN 20, the acknowledgment signal indicating "message received" is provided to the paging terminal 32. The paging terminal 32, in response to reception of the acknowledgment signal, can generate a message received response signal that is returned to the message originator at the page entry device 25. This response signal to the message originator can occur while the caller is holding on the input telephone line at the telephone network interface 30 or can be directed to a pager or other communication device that is capable of receiving the response signal.

Alternatively, the acknowledgment signal can indicate the type of message that was received (i.e. a voice, numeric or alphanumeric message), the time the message was received, whether or not the message was received error free, or a personalized acknowledgment signal. The paging terminal 32 can provide the additional information received to the message originator. In addition, the acknowledgment signal could also be used by the paging terminal 32 to initiate retransmission of a message that was received with errors.

Thus, in accordance with the present invention, the paging system 10 need not have dedicated air time or a dedicated channel to receive acknowledgment signals from radio pagers. The combination radio pager/cordless telephone transceiver utilizes a cordless telephone link to provide an acknowledgment signal to the paging system 10 for real time confirmation to a message originator that a message was received.

Referring next to FIG. 2, a flowchart of the operation of the call reception routine of the paging terminal 32 (FIG. 1) begins upon the paging system being

(e) coupling to the combination radio telephone and radio pager via a radio telephone system;

(f) receiving the requested acknowledge back signal via the radio telephone system; and

5 (g) advising the message originator that the message was received.

7. A selective call receiver comprising:

10 a radio frequency (RF) receiver for receiving paging signals transmitted from a paging terminal;

a decoder coupled to the RF receiving means for decoding the paging signals to recover a page;

15 a flagged page identifier for determining whether the page is a flagged page requesting an acknowledge back; and

a controller for coupling to the paging terminal via a radio telephone system and for transmitting an acknowledge back signal thereby in response to the flagged page identifier determining that the page is a flagged page.
20

8. The selective call receiver of Claim 7 wherein said controller comprises:

25 a signal generator for generating an acknowledgment signal in response to the flagged page identifier determining that the page is a flagged page requesting an acknowledge back; and

30 a radio telephone transceiver for coupling to the radio telephone system and transmitting the acknowledgment signal to the paging terminal via the radio telephone system in response to the flagged page identifier determining that the page is a flagged page requesting an acknowledge back.

35

put into service 100. Processing then awaits reception of an incoming call 102 from a message originator. When an incoming call is received 102, via the telephone network interface 30 (FIG. 1), the call is answered 104 and the
5 paging terminal provides a voice prompt 106 requesting the caller (message originator) to enter the message via the page entry device 25 (FIG. 1). As the message is entered, it is stored 108 in a buffer memory of the paging terminal 32 (FIG. 1) until the end of message is detected 110.
10 When the end of message is detected 110, it is determined whether an ack-back signal is requested 112. If no ack-back signal is requested 112, the message is recalled from the temporary message memory 42 by the paging terminal 32 and placed in the paging system queue 36 such that the
15 message is queued for paging transmission 114. Processing then returns to await the next incoming call received 102.

 If ack-back signaling is requested 112, the message is recalled from the message memory 42 and provided to the paging system queue 36 (FIG. 1) such that the message is
20 queued for paging transmission on a priority basis 116. A recording is then played 118 to the caller asking the caller to wait for an acknowledgment (ack-back) signal. Processing then awaits for the ack-back signal to be received 120 or for the time out limit to be reached 122.
25 The time out limit is a predetermined time which the system will keep the caller on the line to await reception of an ack-back signal. When a time out limit is reached 122, a message is played to the caller that no response has been received 124 the paging terminal 32 hangs up 126,
30 and processing returns to await the next incoming call received 102. If an ack-back signal is received 120 within the time out limit, the ack-back signal is examined to see if a predetermined security identification (ID) code is received 127. If the security ID code is not
35 received 127 with the ack-back signal, processing returns to await reception of another ack-back signal 120 or time out 122. The security ID code prevents falsing by

identification signal uniquely identifies the combination radio paging receiver and radio telephone.

4. The combination radio paging receiver and radio
5 telephone of Claim 1 further comprising user input means
coupled to the control means for providing user input
signals thereto, and wherein the control means couples the
radio telephone means to the radio telephone system to
communicate the user input signals to the paging terminal
10 in response to the determining means determining that the
page requests the acknowledge back signal.

5. The combination radio paging receiver and radio
telephone of Claim 1 wherein the radio telephone means
15 comprises cordless telephone means for coupling to a
cordless telephone system call point transceiver for
communicating thereby, and wherein the control means
couples the cordless telephone means to the cordless
telephone system call point transceiver to communicate the
20 acknowledge back signal to the paging terminal in response
to the determining means determining that the page
requests the acknowledge back signal.

6. A method for transmitting messages in a paging
25 system to a combination radio telephone and radio pager,
the method comprising the steps of:

(a) receiving message information from a message
originator;

(b) determining whether the message originator
30 wishes an acknowledge back signal in response to reception
of the message information by the radio pager;

(c) flagging the message information as a flagged
message requesting an acknowledge back signal upon
reception if the message originator wishes an acknowledge
35 back signal;

(d) transmitting the flagged message to the
combination radio telephone and radio pager;

verifying that the ack-back signal originated in response to the caller's message. It is desirable that a hospital, for example, receives a verified acknowledgement that a doctor has been paged. If the security ID code is
5 detected 127, the ack-back response, either a standard message (e.g. "No Acknowledgment Signal Received") or a message generated by the pager user is relayed to the caller 128. The paging terminal 32 then hangs up 126 and processing returns to await reception of the next incoming
10 call 102.

Referring to FIG. 3, the combination radio pager and cordless telephone transceiver 40 (FIG. 1) according to the preferred embodiment of the present invention comprises a paging receiver section 200, a cordless
15 telephone transceiver section 205, and a message and display controller section 210. The paging receiver section 200 includes an antenna 212 for receiving selective call signals, a paging channel radio frequency (RF) receiver 214 coupled to the antenna for demodulating
20 the selective call signals, and a selective signaling decoder 216 for decoding the demodulated signal to recover the page transmitted thereon.

The decoded page is provided to a message processor and display controller 220 for processing thereby. In
25 accordance with conventional paging operations, the decoded page is stored in a message memory 222 and the user (subscriber) is alerted via an alert device 224 that a page has been received. The user can activate user and display controls 226 to retrieve the page from the message
30 memory 222 and display the page on a message display 228. The controls 226 can manipulate the message display 228 or alter receiving parameters in a manner well known to those skilled in the art.

In accordance with the present invention, certain
35 paging address codes or "flag" signals appended to a message cause the message processor 220 to initiate a telephone call via the cordless telephone transceiver

CLAIMS

1. A combination radio paging receiver and radio telephone comprising:

- 5 first receiving means for receiving paging signals provided from a paging terminal;
decoding means coupled to the first receiving means for decoding the paging signals to recover a page;
determining means for determining whether the page
10 requests an acknowledge back signal;
radio telephone means for coupling to a radio telephone system for communicating thereby; and
control means coupled to the determining means and the radio telephone means for coupling the radio telephone
15 means to a radio telephone system to communicate the acknowledge back signal via the radio telephone system to the paging terminal in response to the determining means determining that the page requests the acknowledge back signal.

20

2. The combination radio paging receiver and radio telephone of Claim 1 wherein the determining means comprises:

- processing means for detecting and counting a number
25 of errors in the page; and
retransmission requesting means for determining that an acknowledgment signal requesting retransmission of the page is required in response to the number of errors being greater than a predetermined number.

30

3. The combination radio paging receiver and radio telephone of Claim 1 wherein the control means couples the radio telephone means to the radio telephone system to
communicate the acknowledge back signal and a pager
35 identification signal to the paging terminal in response to the determining means determining that the page requests the acknowledge back signal, wherein the pager

section 205 when the unit is within range of a cordless telephone call point station 15 (FIG. 1). Therefore, when the alert signal is generated, the alert device 224 alerts the user that a message has been received, and, depending on the desired operation, can either indicate that a return acknowledgment signal has been requested so that the user can initiate the response, or it can automatically generate the return acknowledgment signal. The acknowledgment signal is generated by activating the cordless telephone transceiver section 205 of the combination radio pager/cordless telephone transceiver 40.

Operation of the cordless telephone section 205 is controlled by a telephone control logic device 230. An antenna 232 is utilized for transceiving signals for conventional transceiver operation. The antenna 232 is coupled to a transmit-receive switch 234 which operates under the control of the telephone control logic 230. The transmit-receive switch 234 in one position couples the antenna 232 to a telephone channel RF receiver 236 for processing received RF signals and providing the signals to the telephone control logic 230. In a second position, the transmit-receive switch 234 couples the antenna 232 to a telephone channel transmitter 240 which processes signals received from the telephone control logic 230 for transmittal as an RF signal from the antenna 232.

Alternatively, a speaker 238 can be coupled to the receiver 236 and a microphone 242 can be coupled to the transmitter 240 for conventional cordless telephone operation. In the alternative embodiment, the receiver 236 would provide audio portions of the signals to the speaker 238 and digital portions of the signals to the telephone control logic 230. The transmitter 240 would process audio signals received from the microphone 242 and digital signals received from the telephone control logic 230 for transmission from the antenna 232. In addition, a microphone 242 could allow a user to provide a

provided 322 to the paging terminal 32. The call is then terminated 324 and processing returns to await the next message received having an assigned paging address code 302.

5 Therefore, in accordance with the present invention, paging messages transmitted from a paging terminal and received by the radio pager can be acknowledged via a cordless telephone link between a transceiver coupled to the radio pager and the paging terminal.

10 By now it should be appreciated that there has been provided an ack-back signaling system which does not take air time from the selective call signaling system, while not requiring a devoted communications path.

personalized acknowledgment response to a message originator.

In accordance with the present invention, when the cordless telephone transceiver section 205 is activated in an 'acknowledge' mode, the receiver 236 searches for a signal from a cordless telephone call point station 15 (FIG. 1). When the receiver 236 determines that the combination radio pager/cordless telephone transceiver 40 is within range of a call point station 15, the telephone control logic 230 activates the transmitter 240 to place a call through the call point station 15 to the paging terminal 32 (FIG. 1). When the paging terminal 32 answers the acknowledgment call, the processor 220 provides a special code thereto that identifies the specific radio pager 40 that is calling and a message received acknowledgment signal. The acknowledgment signal can optionally indicate the type of message that was received (i.e. a voice, numeric or alphanumeric message), the time the message was received, whether or not the message was received error free, or a personalized acknowledgment signal. In addition, the acknowledgment signal could also be used by the paging terminal 32 to request retransmission of a message that was received with errors.

Referring next to FIG. 4, the operation of the paging message processor 220 in accordance with the preferred embodiment of the present invention starts 300 upon powering up of the combination radio pager and cordless telephone transceiver 40. Processing of messages awaits reception of a message having a paging address code assigned to the radio pager 40.

When an assigned paging address code is received 302, processing determines if an acknowledgment (ack-back) signal is requested 304. If the message is a flagged message, having been flagged by the ack-back message flagger 42 (FIG. 1), an acknowledgment signal is requested 304. Also, a predetermined assigned paging address code

could indicate that an acknowledgment signal is requested 304.

If an acknowledgment signal is not requested 304, the message is stored 306 for subsequent retrieval by the user in accordance with conventional pager operation and an alert is generated 308 to notify the user that a message has been received and stored. Processing then returns to await reception 302 of a next message having an assigned paging address code.

10 If an acknowledgment signal is requested 304, the message is stored 310 and an alert is generated 312. In accordance with the present invention, the acknowledgment signal response is generated 314 including a security ID code assigned to the pager. The acknowledgment signal can
15 be automatically generated or can allow for personalization by the user through activation of the controls 226 or through entry of a voice message via the microphone 242 (FIG. 3). In addition, a particular response requesting retransmission could be generated by
20 the processor 220 in response to detection of sufficient errors in the received message to indicate that the message may not have been correctly received. The security ID code authenticates the acknowledgment signal, verifying that the acknowledgment signal originated from
25 the pager/cordless telephone 40.

After generation of the acknowledgment signal 314, the processor 220 activates the cordless telephone transceiver section 205 in the acknowledge mode 316. Upon activation 316 of the transceiver section 205, the
30 receiver 236 searches for a call point station 318. When a call point station signal is detected 318, a cordless telephone link is established between the transceiver section 205 and a call point station. The processor 220 signals the telephone control logic 230 to call up 320 the
35 paging terminal 32 (FIG. 1). When the transceiver section 205 is coupled to the paging terminal 32 via the cordless telephone link, the generated acknowledgment signal is